SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Conditions of the Contract and Division One apply to all work of this Section.

B. Contractor shall provide all materials, labor, and the means and methods to complete the installation defined by the plans and these specifications.

PART 2 – PRODUCTS

2.1 RACEWAY

A. All wiring shall be run in raceway.

B. The size of each raceway shall be largest of the following:

1. Minimum size to be 1/2".
2. Telephone and data communications conduits to be 3/4" minimum.
3. The size required by code fill table for THW to accommodate the number, size, and type of wires shown or specified or recommended by the manufacturer of the equipment served and also ground conductor.
4. The size noted on the Drawings.

C. Conduit Fittings: Except where otherwise noted, conduit fittings shall be Appleton, Crouse-Hinds, or equal. Unilets, condulets, etc., shall be malleable iron and fitted with cover and gasket.

D. Conduit Supports: Kindorf, Unistrut, T&B, or equal. All multiple hanger and support parts shall be zinc coated by hot dipping or electroplating or otherwise protected against corrosion.

E. Conduit Straps: T&B, Gedney, or equal, one or two hole malleable iron or snap type steel with ribbed back, galvanized or cadmium plated.

F. Cable Supports: Cable supports and boxes shall be installed for all vertical feeders in accordance with the schedule in the California Electrical Code. Cable supports shall be of the split wedge type which clamp each individual conductor firmly and tightens due to weight of cable. For cables with a metallic sheath, a basket weave or equal type of support shall be provided.

G. Acceptable raceway systems and their limitations of use are as follows:

1. Rigid Steel Conduit (RSC):

a. Standard weight, zinc coated on outside by hot dipping with either zinc coating or other U.L. approved corrosion resistant coating on inside.
b. Fittings shall be threaded and finished similar to conduit. Threadless fitting shall not be used. All joints shall be coated with conductive antiseize compound, T&B "Kopr-Shield" or approved equal, except where conduit is

run in permanently dry locations. Engineer knows of no equal to "Kopr-Shield".

c. Conduits connected to boxes and cabinets shall be fitted with two locknuts and insulated bushings, OZ B Series, Appleton BU Series, or equal, U.L. approved and bonded. Grounding bushings shall be used whenever grounding conductors are installed.
d. Conduit stubs shall be capped with coupling, nipple, coupling and plug.

2. Intermediate Metal Conduit (IMC): Requirements for IMC are same as specified for RSC.
3. Electric Metallic Tubing (EMT):

a. Rolled steel, zinc coated outside with either zinc coating or other approved corrosion-resistant coating on the inside.
b. Couplings shall be compression type - Appleton 95-T Series, T&B 5123 Series, or equal. (Contractor may use concrete tight steel set screw couplings, Appleton TWC-5 Series, T&B TK-120 Series, or equal. When using set screw fittings, a green insulated bonding conductor shall be provided in raceway.)
c. Connectors shall be compression type with insulated throat - Appleton 86-T Series, T&B 5123 Series, or equal. (Contractor may use concrete tight steel set screw couplings, Appleton TW50-SI Series, T&B TC-720 Series, or equal. When using set screw fittings, a green insulated bonding conductor shall be provided in raceway.)
d. Maximum trade size, two inches (2").
e. May be used:

1) Concealed in stud partitions.
2) Concealed above furred ceilings.

4. Flexible Metal Conduit:

a. Minimum trade size, one-half inch (1/2"), unless specified otherwise in other sections of these specifications. Flexible conduit shall be steel.
b. Connectors - T&B "Tite Bite" insulated. Engineer knows of no equal. Where used for connection of recessed fixtures, connectors may be of the type that screw into inside of conduit, Efcor 1100 Series, Steel City XC-840 Series, or equal.
c. May be used only for crossing of seismic joints, connection of recessed fixtures, controls and mechanical equipment, and devices mounted to T-bar ceilings.
d. Length shall be a practical minimum but to allow for movement of equipment connected without restricting flexibility of conduit.

2.2 BOXES AND ENCLOSURES

A. All boxes and enclosures shall be suitable for the environment in which they are installed.

B. Outlet Boxes:

1. Outlet boxes shall be of welded construction or one piece deep-drawn steel, galvanized gang type. Octagon concrete rings may be folded type. Sectional boxes shall not be used.
2. Each box shall be large enough to accommodate the required number and sizes of conduits, wires, splices, and devices but not smaller than size shown or specified.
3. Switch and receptacle boxes shall be not less than 4" square by 1-1/2" deep for single devices, 4-11/16" by 1-1/2" deep for two devices. Telephone and signal boxes shall be not less than 4-11/16" square x 2-1/8" deep.

C. Junction Boxes and Pullboxes:

1. Less than 100 cubic inches shall be as specified for outlet boxes. Boxes having internal volume greater than 100 cubic inches shall be of panelboard type construction except that covers shall be secured by screws or bolts.
2. All boxes shall be installed so that covers are accessible after completion of the installation.

D. Box Mounting: Boxes shall be independently and securely supported in place by wood blocking spanning stud space or manufactured adjustable channel type hanger, Steel City, Raco, or approved equal. Use wood screws to fasten to wood blocking or sheet metal screws to attach to metal channel. Side strap mounting shall not be used. Attach blocking or channel to studs using wood screws. Sheetrock screws or deck screws shall not be used. Surface boxes shall be supported with expansion screws, bolts, or anchors. Suspended boxes shall be supported with threaded rods or strut assemblies attached directly to structural members by means of bolts or anchors.

E. Size: Provide size shown on Drawings. If sizes are not shown, provide boxes sized per Codes. (Note: Minimum size may be indicated in Symbol List on Drawings.)

PART 3 – EXECUTION

3.1 RACEWAY SYSTEMS

A. Individual horizontal raceways not larger than 1-1/2" size shall be supported by means of straps or individual hangers. Individual horizontal raceways larger than 1-1/2" size shall be supported by individual hangers.

B. Where two or more horizontal raceways run parallel and at the same elevation, they shall be supported on multiple hangers. Each raceway shall be secured to the horizontal hanger member with a U-bolt, strap, or other specially designed and approved bolted fastener. Hanger rods used in conjunction with multiple hangers shall be 3/8" diameter or larger, galvanized steel rods.

C. Vertical raceways not larger than 1-1/2" shall be supported by riser clamps at each floor or by straps not over 8' apart. Vertical raceways, conduits, and EMT larger than 1-1/2" shall be supported by riser clamps at each floor. Short vertical drops larger than 1-1/2" shall be supported by hangers close to the elbows at the tops and additionally secured to walls, columns, etc. by straps spaced not over 8' apart.

D. Multiple conduit hangers shall consist of two or more steel hanger rods, a steel horizontal member, and all U-bolts, clamps, and other attachments necessary for securing hanger rods and conduits. Hanger rods shall be threaded either full length or for a sufficient distance at each end to permit at least 1-1/2" of adjustment. Horizontal members shall be standard structural steel shapes such as angles or channels or 1-1/2" x 1-1/2", No. 12 gauge, cold formed, lipped channels designed to accept special spring-held hardened steel nuts for securing hanger rods and other attachments. Two or more channels may be welded together to form horizontal members of greater strength than single channels.

E. Straps and hanger rods shall be fastened to concrete by means of inserts or expansion bolts, to brickwork by means of expansion bolts, to hollow masonry by means of toggle bolts, to metal surfaces with machine screws, and to wood construction with wood screws. Expanders and shields shall be steel or malleable iron. Sizes of shields and bolts shall be such that the proof test load will not be less than four times the actual working load. Deck screws or sheetrock screws shall not be used. Wooden plugs and lead shields shall not be used for fastening. Perforated strap iron or nail straps shall not be used. Straps shall be screw fastened.

F. In any raceway run, the number of 1/4 bends, or the equivalent, between terminations at cabinets, outlet boxes, junction boxes, and pullboxes, shall not exceed the number of 1/4 bends indicated below, and the total length of run shall not exceed 150 feet. Straight runs of conduit shall not exceed 250 feet in length between terminations at cabinets, outlet boxes, junction boxes, and pullboxes.

Conduit Size - Inches	Number of ¼ Bends
½ to 1¼	4
1½ to 2½	3
3 to 4	2

G. The size of each run of raceway shall be largest of the following:

1. Minimum size to be 1/2".
2. Telephone and data communications conduits to be 3/4" minimum.
3. The size required by code fill table for THW to accommodate the number, size, and type of wires shown or specified or recommended by the manufacturer of the equipment served and also ground conductor.
4. The size noted on the Drawings.

H. The Contractor's attention is directed to check the size of all raceways to determine that the green equipment ground conductor, specified, shown or required, can be installed in the same raceway with phase and neutral conductors in accordance with the percentage of fill requirements of codes. If necessary, the Contractor shall increase the raceway sizes shown or specified to accommodate all conductors without additional cost to the Owner.

I. Conduit caps shall be installed during construction.

J. Flexible conduit shall be used to cross seismic joints.

3.2 BOXES

A. Blank covers of all junction boxes shall be marked to show use, such as Fire Alarm, Telephone, Intrusion Alarm, Signal, etc. Power box covers shall be marked to show circuit numbers contained in box. Use permanent black marker.

END OF SECTION